4 ATOMIC STRUCTURE

Practice Problems

In your notebook, solve the following problems.

SECTION 4.1 DEFINING THE ATOM

1. According to Figure 5.2, 100,000,000 copper atoms would form a line 1 cm long. How long would a line formed by 1×10^7 copper atoms be? Express your answer in millimeters.

SECTION 4.2 STRUCTURE OF THE NUCLEAR ATOM

1. A sulfur-32 atom contains 16 protons, 16 neutrons, and 16 electrons. What is the mass (in grams) of a sulfur-32 atom?
2. The mass of a neutron is 1.67×10^{-24} g. Approximately what number of neutrons would equal a mass of one gram?
3. Which statement is consistent with the results of Rutherford's gold foil experiment?
   a. All atoms have a positive charge.
   b. Atoms are mostly empty space.
   c. The nucleus of an atom contains protons and electrons.
   d. Mass is spread uniformly throughout an atom.

SECTION 4.3 DISTINGUISHING BETWEEN ATOMS

1. How many protons are found in an atom of each of the following?
   a. boron
   b. sulfur
   c. neon
   d. lithium

2. Complete the table for the following elements.

Element	Number of Protons	Number of Electrons	Number of Neutrons	Atomic Number	Mass Number
Manganese	25		30		
Sodium		11	12		
Bromine	35		45		
Yttrium				39	89
Arsenic		33			75
Actinium					227

3. How many neutrons are in each atom?
   a. $^{23}_{11}\mathrm{Na}$
   b. $^{238}_{92}\mathrm{U}$
   c. $^{81}_{35}\mathrm{Br}$
   d. $^{19}_{9}\mathrm{F}$

4. The two most abundant isotopes of carbon are carbon-12 (mass = 12.00 amu) and carbon-13 (mass = 13.00 amu). Their relative abundances are 98.9% and 1.10%, respectively. Calculate the atomic mass of carbon.
5. Element X has two isotopes: X-100 and X-104. If the atomic mass of X is 101 amu, what is the relative abundance of each isotope in nature?